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Bioelectricity production and microbial communities in microbial fuel cell powered by macroalgal biomass

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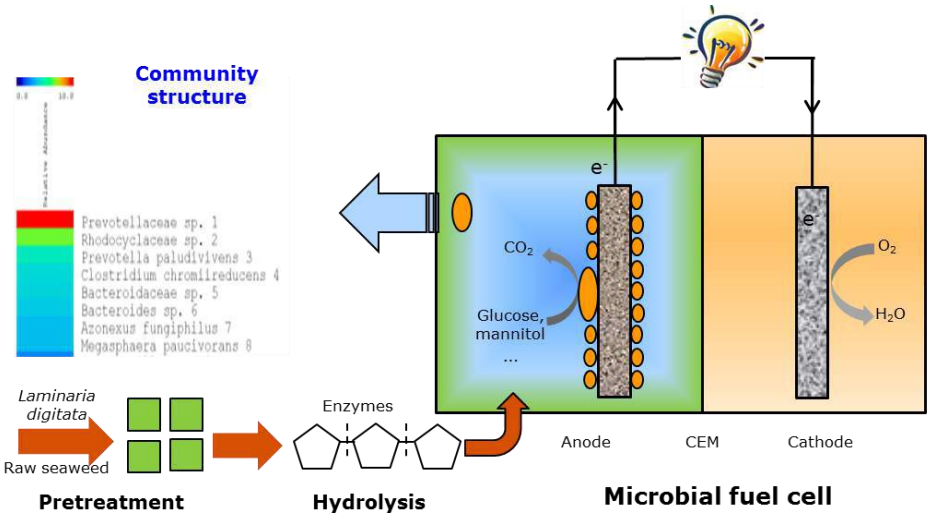

The potential of macroalgae *Laminaria digitata* as substrate for bioelectricity production was examined in a microbial fuel cell (MFC). A stable voltage of 0.6 V (at 1000 ohm) was achieved without any lag time due to the high concentration of glucose and mannitol in the hydrolysate, and it lasted for over 35 days. Total TCOD removal efficiency remained high and reached over 95% at the end of the test. However, the coulombic efficiency was low approx. 12%. The volatile fatty acids analysis implied that glucose and mannitol were degraded through isobutyrate as intermediate. During the operation, pH in anode and cathode exhibited reverse variation because of the proton accumulation in anode. The 16S rRNA gene high throughout sequencing analysis of anodic biofilm revealed complex microbial composition dominated by *Bacteroidetes* (39.4%), *Firmicutes* (20.1%), *Proteobacteria* (11.5%), *Euryarchaeota* (3.1%), *Deferribacteres* (1.3%), *Spirochaetes* (1.0%), *Chloroflexi* (0.7%), *Actinobacteria* (0.5%), and others (22.4%). The predominance of *Bacteroidetes*, *Firmicutes* and *Proteobacteria* demonstrated their importance for substrate degradation and simultaneous power generation. These results demonstrate that macroalgae hydrolysate can be used as a renewable carbon source of microbial electrochemical systems for various environmental applications.